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Title: Design and Data Package for Shots R306-23134, R306-23135, R306-24201  
and R306-24202

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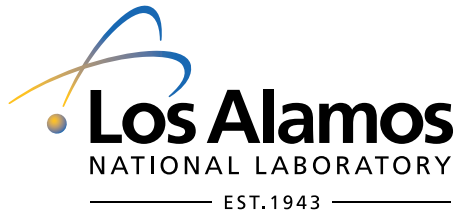
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*XTD-NTA: Nuclear Threat Assessment*

**LA-UR-17-**

**Design and Data Package for Shots  
R306-23134, R306-23135, R306-24201 and R306-24202  
Version 1**

**Report Date: September 14, 2017**

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This report documents the design and data for four related shots; R306-23134, R306-23135, R306-24201 and R306-24202.

The basic designs of these four shots are the same. A high-explosive plane-wave lens launches a flyer towards an acceptor material with a smaller diameter. This acceptor is either another piece of high-explosive or a piece of polyethylene. A detonation or shock wave propagates through this material and launches a second flyer. The velocities of both flyers are recorded using Photon Doppler Velocimetry (PDV). Schematics of the shot assembly are shown in Figures 1 and 2. The overall shape of the shots is reminiscent of a tiered wedding cake and, consequently, these shots are sometimes known as the Wedding Cake shots. The design differences among the four shots (the acceptor material and the second flyer design) are given in Table 1. Note that one of the shots was never fired; it is mentioned merely out of a desire for completeness.

Shot number	Shot Date	Acceptor Material	Second Flyer (See Fig. 7)
R306-23134	November 12, 2014	PBX-9501	304 Stainless, 2.0 mm thick
R306-23135	not fired	Low Density Polyethylene	304 Stainless, 2.0 mm thick
R306-24201	November 10, 2015	PBX-9501	Ta (as drawn in Fig. 7)
R306-24202	November 10, 2015	Low Density Polyethylene	Ta (as drawn in Fig. 7)

Table 1: Summary of differences among four Wedding Cake shots.

Five PDV probes were installed on the “PDV Plate” (Figure 9) and three were installed on “Barrel2” (Figure 4). The five probes on the PDV Plate interrogated the velocity of the acceptor flyer while the three on Barrel2 interrogated the donor flyer. On the PDV Plate, the probes were installed along the single line of holes that is shown as horizontal in the drawing; that is, the line that is perpendicular to the A-A section plane. The probes were numbered, going from left to right, probe 5, probe 4, probe 1, probe 2, and probe 3. Four of the probe holes in the line were left empty such that occupied and unoccupied holes alternated. Thus, probe 1 occupied the center hole, probes 5 and 3 occupied the outermost holes and probes 2 and 4 occupied holes halfway between the outermost and center holes.

PDV probes 6, 7 and 8 were installed on the three small holes on Barrel2. The PDV Plate and Barrel2 are aligned with respect to each other such that the 0.375” clearance holes are constrained by the Base Plate to be on the same radial lines (see Figure 5). There are thus six permutations of probe locations (relative to the probes on the PDV plate) possible on Barrel2. Unfortunately, the identity of the combination that was fielded was not preserved.



Velocity versus time data determined from the PDV probes for the three conducted experiments are recorded in CSV files. The filenames and md5 checksums for the four data files are:

R306-23234_Ch1-5_PDV_data	f43f74dc63e6073f209c14ac3499e544
R306-23234_Ch6-8_PDV_data	3183cbd2a39a6660c902b23e0b4e43d2
R306-24201_Ch1-8_PDV_data	4821d35345a7ef1077cbca1c6ff977ed
R306-24202_Ch1-8_PDV_data	e1d556f19fff05588384a697ec043d91

The four files were compressed into a single “zip” file with md5 checksum:

R306-WCexp_PDV_data.zip	173cbd1d48f8d8bc82c7d528ba71bfe8
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The signals returned from channels one through five for experiment R306-23234 between 43.0  $\mu$ s and 45.5  $\mu$ s were very weak and the evaluated velocities should be considered suspect.

No material specifications are available for the components used. No inspections of components or the experimental assembly were performed beyond casual visual inspection.

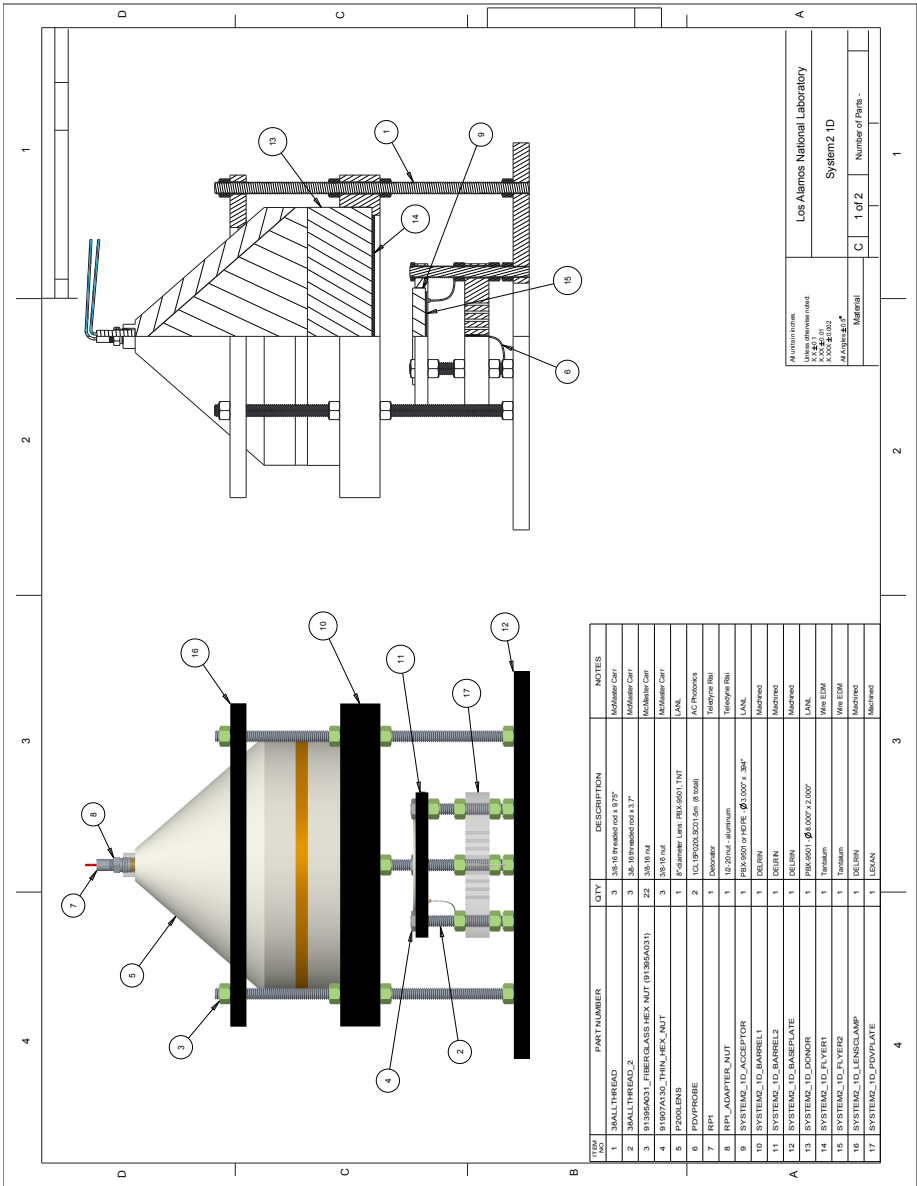


Figure 1: Bill of materials

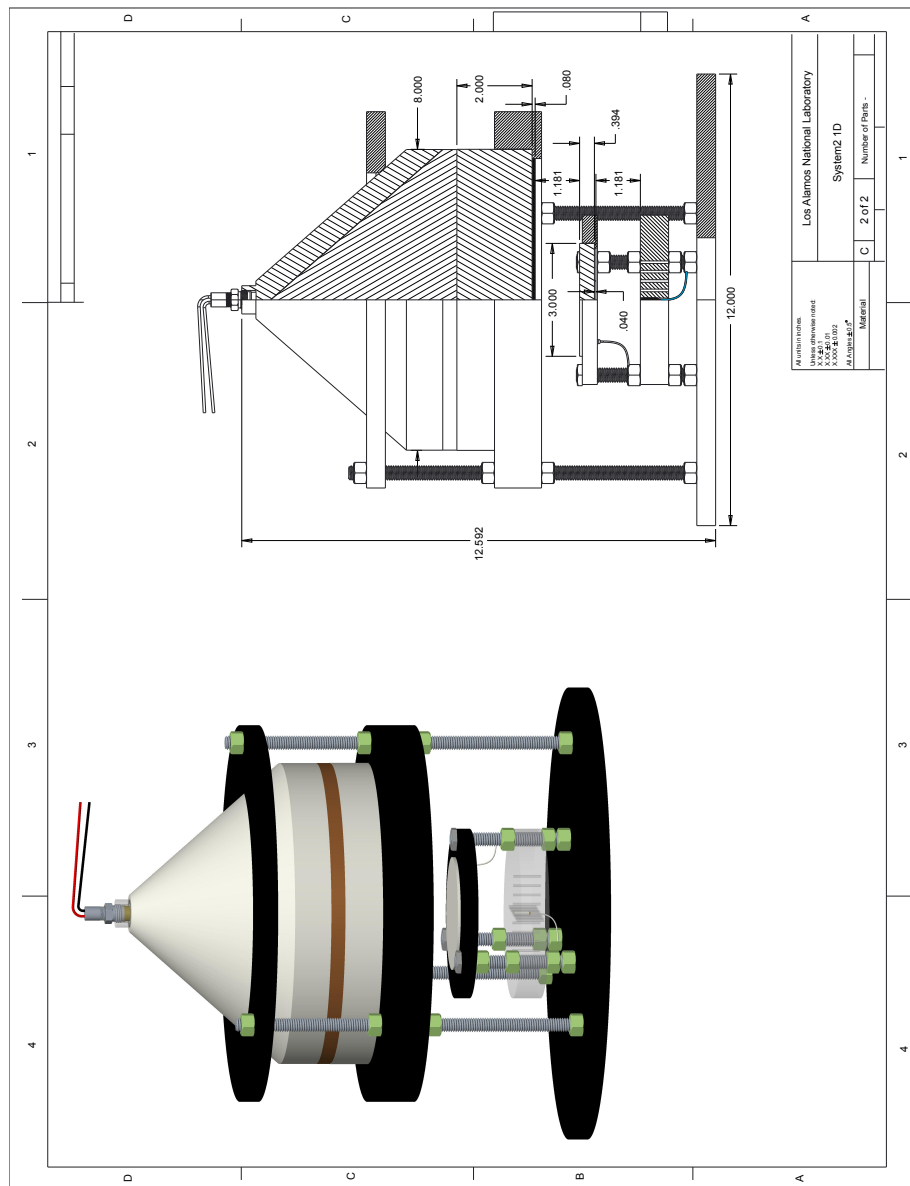


Figure 2: Dimensions of experiment assembly

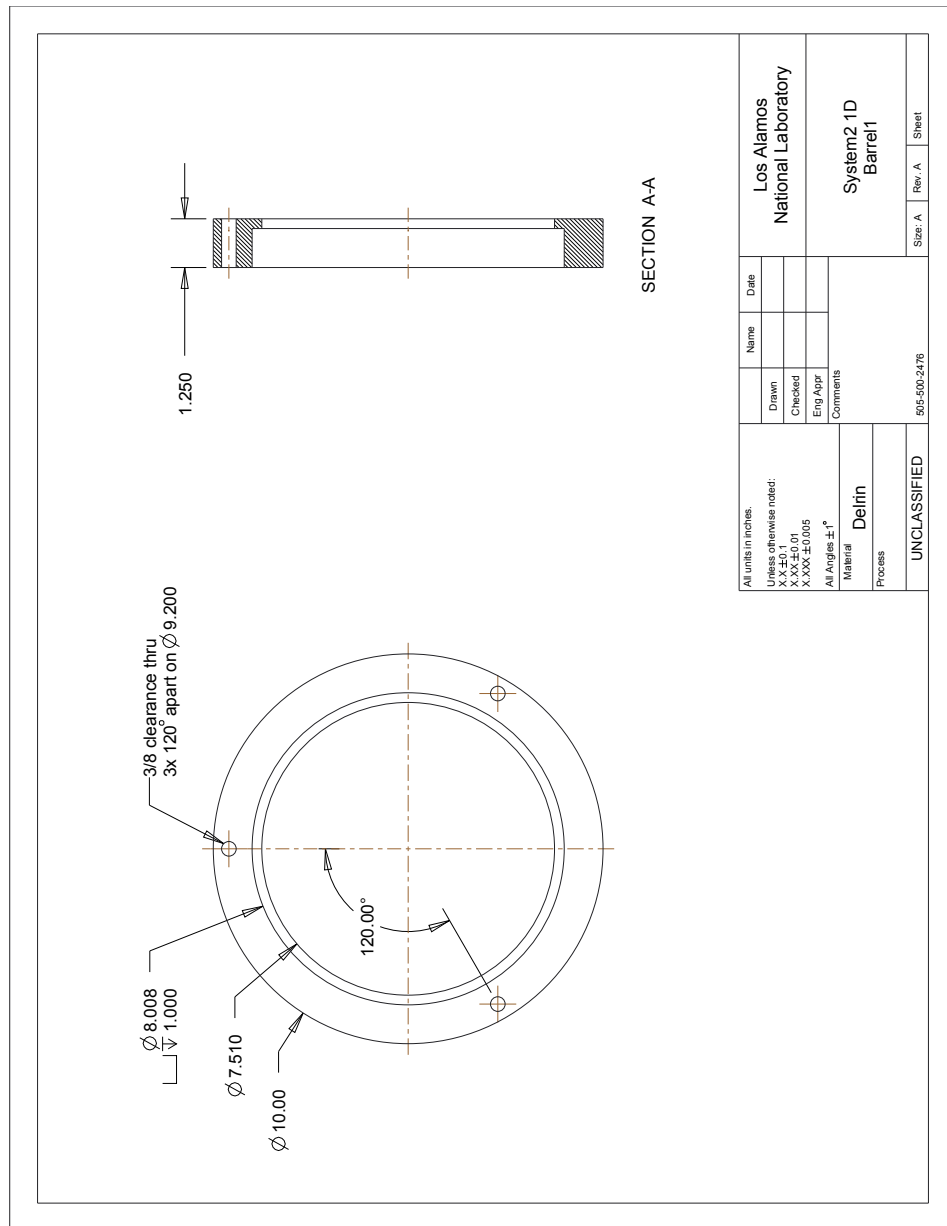


Figure 3: Component drawing

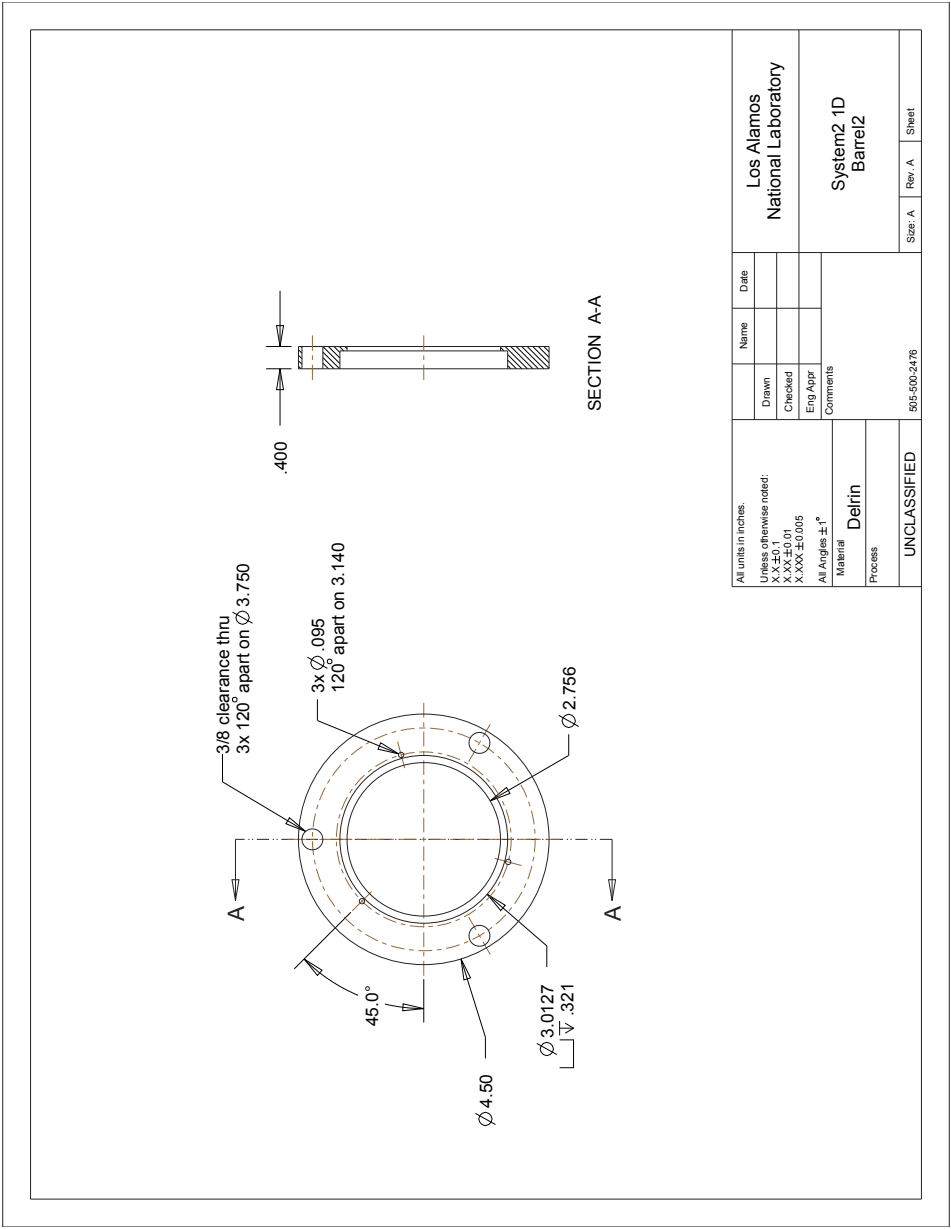


Figure 4: Component drawing

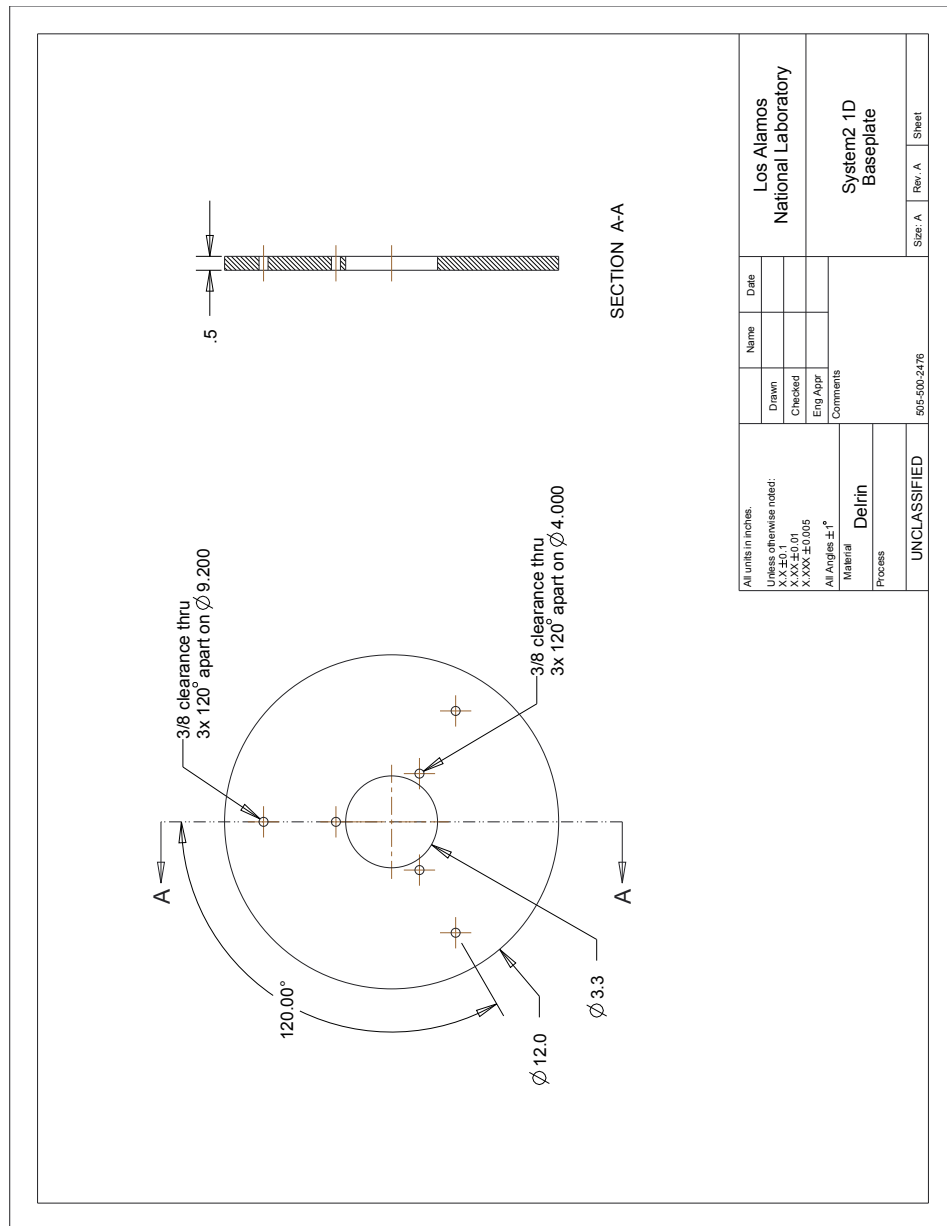


Figure 5: Component drawing

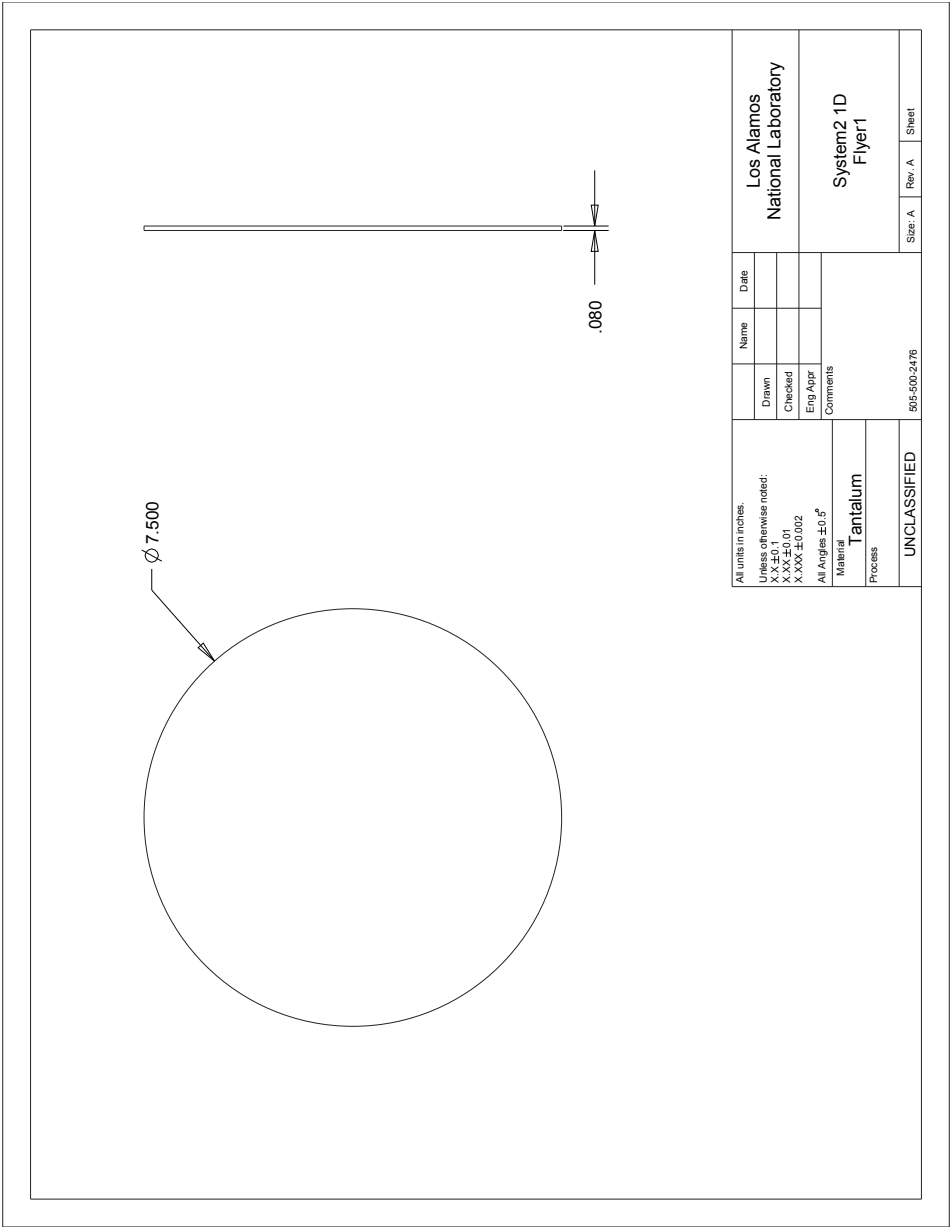


Figure 6: Component drawing

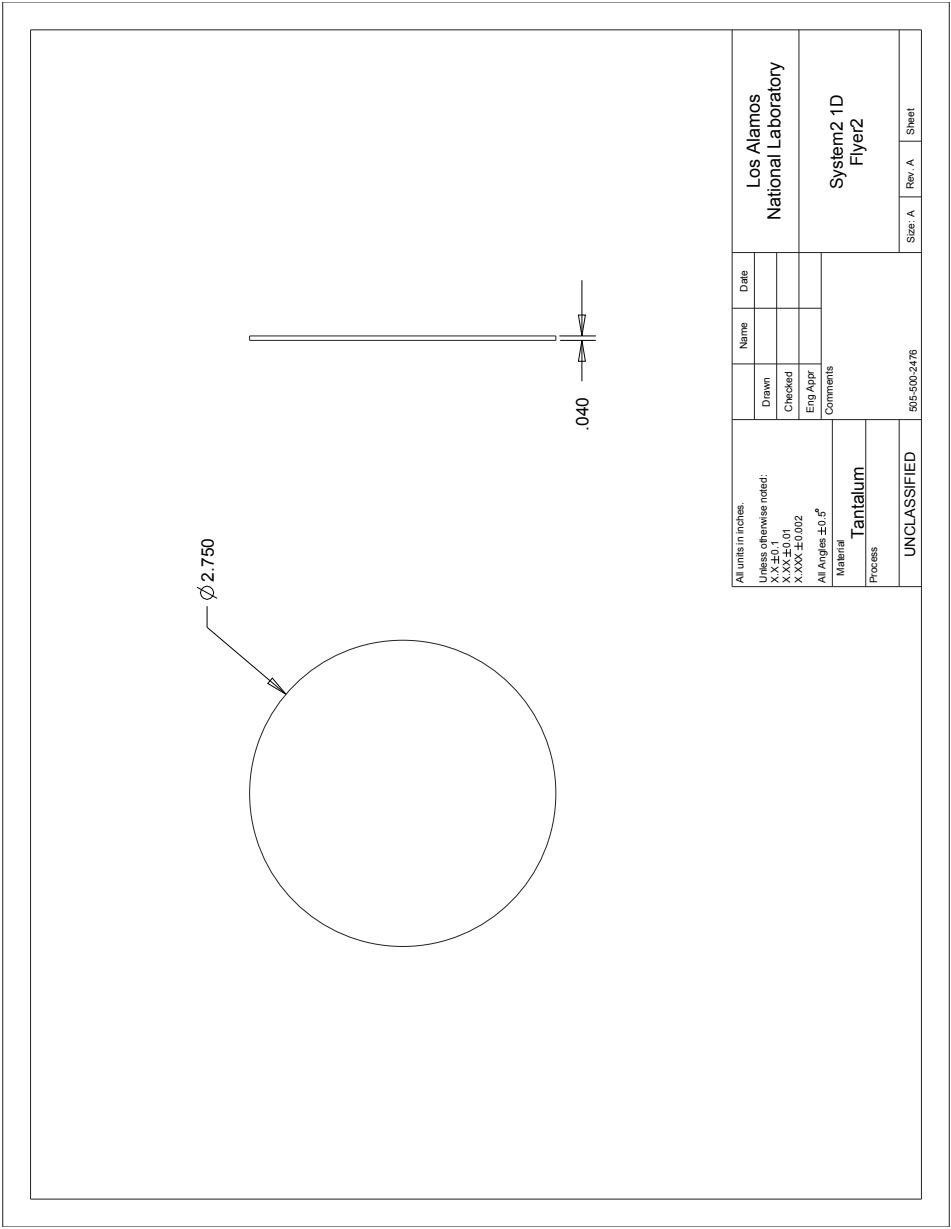


Figure 7: Component drawing





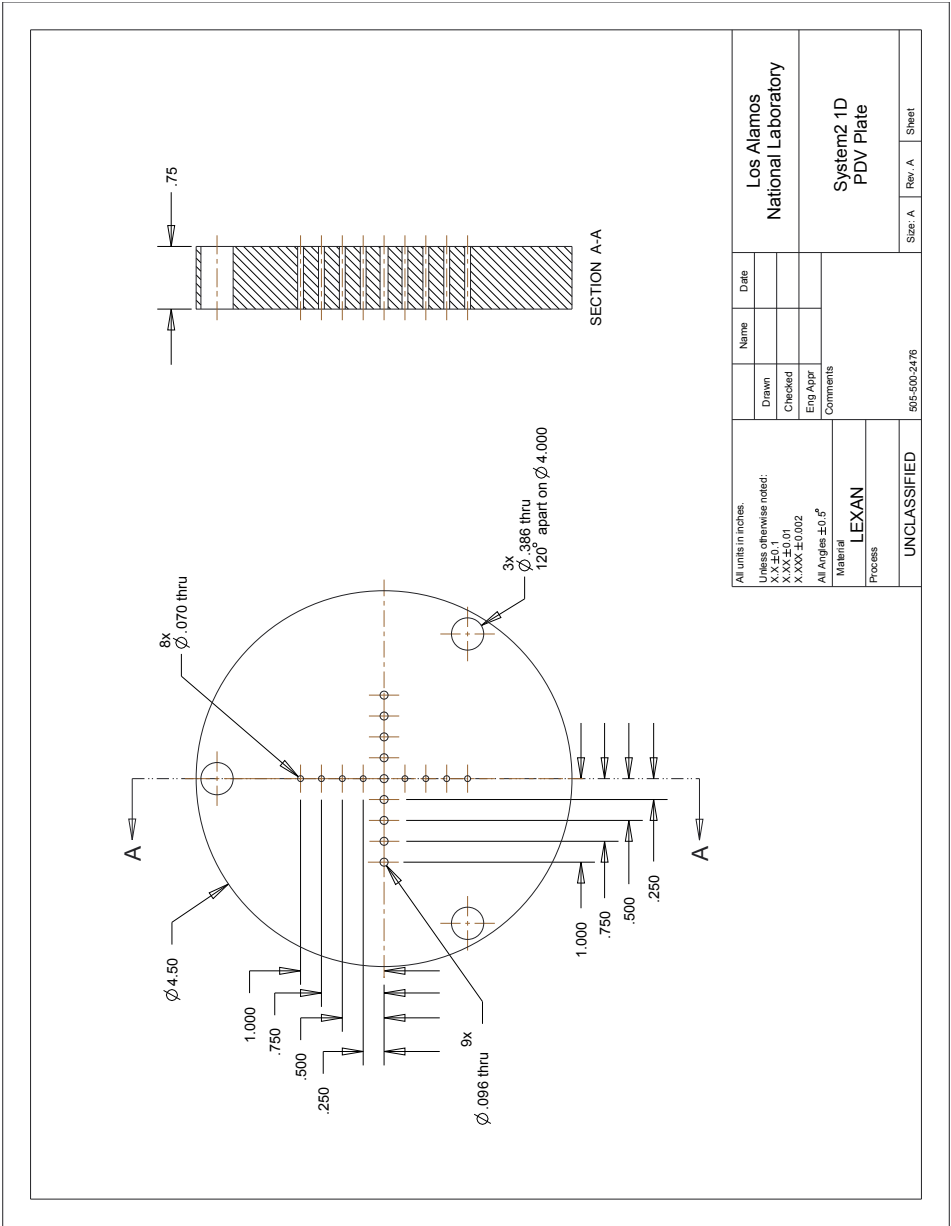


Figure 9: Component drawing

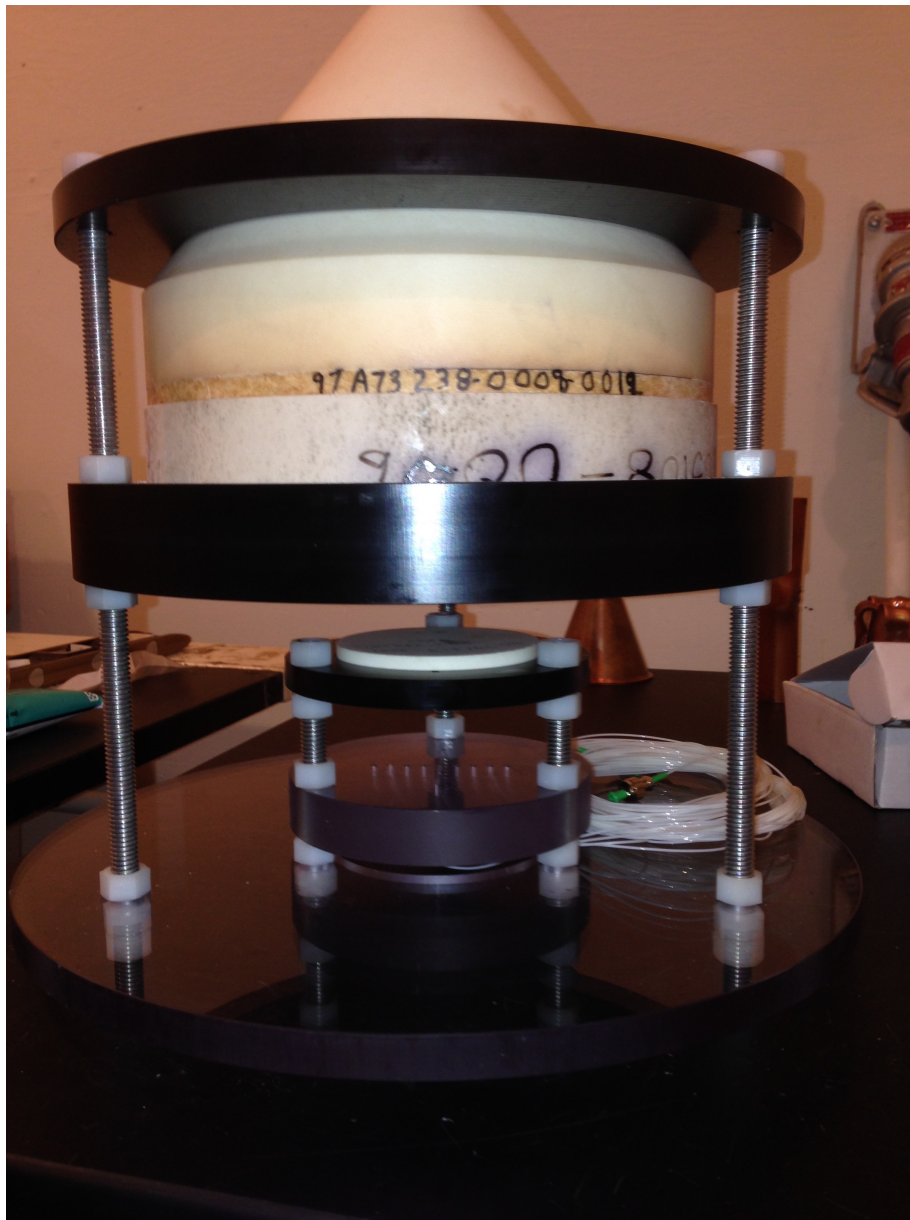


Figure 10: Photo of a Wedding Cake Assembly

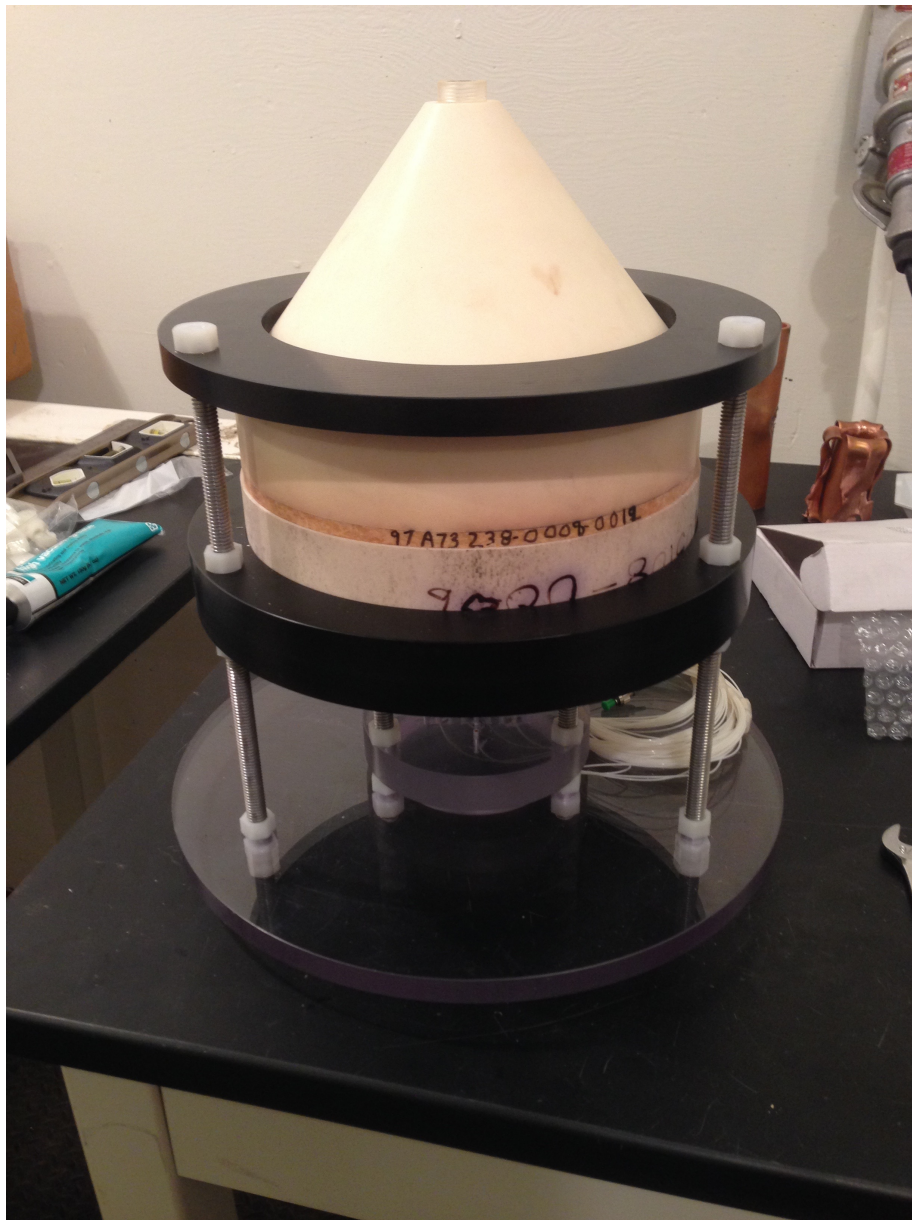


Figure 11: Photo of a Wedding Cake Assembly





Figure 12: Photo of a Wedding Cake Assembly



Figure 13: Photo of a Wedding Cake Assembly